

8. (Amended) A color-filterless full color liquid-crystal display device,
comprising:
 a liquid-crystal shutter portion including TN liquid crystal or STN liquid
 crystal; and
 a backlight portion including light source units and a planar light guide,
 wherein said light source units comprise at least one red LED, at least
 one green LED, and at least one blue LED,
 wherein a first number corresponding to said at least one green LED is
 not larger than a second number corresponding to said at least one red LED and the first
 number corresponding to said at least one green LED is not larger than a third number
 corresponding to said at least one blue LED, and
 wherein said light source units are disposed on an edge of said planar
 light guide.

REMARKS

Claims 1-12 are pending in the application. This Amendment amends claims 1 and 8. No new matter is added to amended claims 1 and 8. Claims 1 and 8 are amended to merely clarify the subject matter of the claims and in no way narrow the scope of the claims in order to overcome the prior art or for any other statutory purpose of patentability. Notwithstanding any claim amendments of the present Amendment or those amendments that may be made later during prosecution, Applicant's intent is to encompass equivalents of all claim elements. Reconsideration in view of the foregoing amendments and the following remarks is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached pages are captioned "Version with markings to show changes made."

Claims 1-12 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 6,0669,676 to Yuyama in further view of U.S. Patent No. 5,835,296 to Natori and U.S. Patent No. 5,130,828 to Fergason.

This rejection is respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention, as described in claim 1, is directed to *inter alia* a color-filterless full color liquid-crystal display device that includes a liquid-crystal shutter portion including twisted nematic (TN) liquid crystal or super twisted nematic (STN) liquid crystal, and a backlight portion including light source units and a planar light guide, in which the light source units comprise at least one red LED, at least one green LED, and at least one blue LED, a first number corresponding to the at least one blue LED is not smaller than a second number corresponding to the at least one red LED, and the first number corresponding to the at least one blue LED is not smaller than a third number corresponding to the at least one green LED, and the light source units are disposed on an edge of the planar light guide.

The claimed invention, as described in claim 8, is directed to *inter alia* a color-filterless full color liquid-crystal display device that includes a liquid-crystal shutter portion including TN liquid crystal or STN liquid crystal, and a backlight portion including light source units and a planar light guide, in which the light source units comprise at least one red LED, at least one green LED, and at least one blue LED, a first number corresponding to the at least one green LED is not larger than a second number corresponding to the at least one red LED and the first number corresponding to the at least one green LED is not larger than a third number corresponding to the at least one blue LED, and the light source units are disposed on an edge of the planar light guide.

An aspect of the present invention is to balance a white color background, when green LED light sources are brighter than red or blue LED light sources, and red LED light sources are brighter than blue LED light sources.

Since the LEDs are disposed on an edge of the light guide, the light from the LEDs is not observed directly. If the LEDs were disposed under the filter directly, contrasts are considerable among the portions where the LEDs are provided and where they are not provided. Thus it is difficult to obtain uniform light over the observation surface.

By disposing the LEDs on a side of the light guide, the light is indirectly observed. Therefore, displaying characteristics of the device is improved.

II. THE PRIOR ART REJECTIONS

A. The Yuyama Reference

Fig. 1 of Yuyama discloses a perspective view of a sequential color display device having a light diffusion plate 4, liquid crystal shutter 6, and shutter controlling circuit 8 (col. 3, lines 19-22). There are provided three color light sources, that is, red, green and blue color LEDs 2a, 2b, and 2c that are arranged in a lateral direction in the LED box 3.

B. The Natori Reference

Fig. 9 of Natori discloses a video display apparatus having a dot matrix of LEDs mounted on an LED matrix board, and a unitary reflecting member made of metal such as aluminum or the like mounted on the LED matrix board.. The reflecting member has slanted reflecting surfaces disposed vertically one on each side of each of the LEDs for reflecting light emitted from the LEDs with narrow vertical directivity. (Abstract, lines 1-7).

C. The Fergason Reference

Fergason teaches, in relevant part, a desired embodiment in which a dye is a high visibility dye, e.g., of green or magenta color, for maximizing brightness.

Claims 1 and 8 recite at least the features of "a backlight portion including light source units and a planar light guide, wherein said light source units comprise at least one red LED, at least one green LED, and at least one blue LED ... wherein said light source units are disposed on an edge of said planar light guide."

Since the LEDs are disposed on an edge of the light guide, the light from the LEDs is not observed directly. If the LEDs were disposed under the filter directly, contrasts are considerable among the portions where the LEDs are provided and where they are not provided. Thus it is difficult to obtain uniform light over the observation surface.

By disposing the LEDs on a side of the light guide, the light is indirectly observed. Therefore, displaying characteristics of the device is improved.

Nowhere do Yuyama, Natori, and Fergason, either individually or in combination disclose or suggest light source units that are disposed on an edge of the planar light guide, as recited in claims 1 and 8.

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In addition, the dye of Fergason absorbs light, and does not emit colored light as do the colored light sources of the claimed invention.

For at least the reasons outlined above, Applicants respectfully submit that Yuyama, Natori, and Fergason either individually or in combination do not teach or suggest every feature of independent claims 1 and 8. Accordingly, Yuyama, Natori, and Fergason either individually or in combination do not render obvious the subject matter of claims 1 and 8, and claims 2-7 and 9-12, which depend from claims 1 and 8, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 1-12 under 35 U.S.C. §103(a) as unpatentable over Yuyama in further view of Natori and Fergason is respectfully solicited.

III. CONCLUSION

In view of the foregoing, Applicant submits that claims 1-12, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 1/3/03


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1 as follows:

1. (Amended) A color-filterless full color liquid-crystal display device, comprising:
 - a liquid-crystal shutter portion including twisted nematic (TN) liquid crystal or super twisted nematic (STN) liquid crystal; and
 - a backlight portion including light source units and a planar light guide,
wherein said light source units comprise [red] at least one red LED, at least one green LED, and at least one blue [LEDs] LED,
wherein [the] a first number [of] corresponding to said at least one blue [LEDs] LED is not smaller than [the] a second number [of] corresponding to said at least one red [LEDs;] LED, and the first number [of] corresponding to said at least one blue [LEDs] LED is not smaller than [the] a third number [of] corresponding to said at least one green [LEDs] LED, and
 - wherein said light source units are disposed on an edge of said planar light guide.

8. (Amended) A color-filterless full color liquid-crystal display device, comprising:
 - a liquid-crystal shutter portion including TN liquid crystal or STN liquid crystal; and
 - a backlight portion including light source units and a planar light guide,
wherein said light source units comprise [red] at least one red LED, at least one green LED, and at least one blue [LEDs] LED,
wherein [the] a first number [of] corresponding to said at least one green [LEDs] LED is not larger than [the] a second number [of] corresponding to said at least one red [LEDs] LED; and the first number [of] corresponding to said at least one green [LEDs] LED is not larger than [the] a third number [of] corresponding to said at least one

blue [LEDs] LED, and

wherein said light source units are disposed on an edge of said planar
light guide.